VIA ELECTRONIC FILING

October 18, 2018

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

TECHNICAL CORRECTION

Ex Parte Communication, Notice of Inquiry on Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz. GN Docket No. 17-183

Dear Ms. Dortch:

On October 11, 2018, the Ultra Wide Band Alliance ("UWB Alliance") filed an Ex Parte Presentation notice regarding a meeting its representatives had with staff from the FCC's Wireless Office of Engineering and Technology to discuss the above-referenced proceeding.[1] During the meeting, UWB Alliance discussed a proposal for spectrum coexistence that would allow for more flexible use in the 6 GHz band, while protecting incumbent licenses users and existing unlicensed UWB users.

UWB Alliance representatives explained that current proposed RLAN deployment, at the requested power levels, would effectively render many UWB products, services and applications useless. UWB Alliance asked the FCC to consider mitigation solutions that will continue to allow for unlicensed UWB technologies to successfully coexist with incumbent users in the 6 GHz band and provide valuable functionality. These following comments are offered for staff to consider as it prepares for the issuance of the Notice of Proposed Rule Making ("NPRM").

NOTE: A technical correction has been made in this document. The original October 11, 2018 filing stated U-NII-5 band as being from 5.925 to 6.245 GHz (Chart, Pg. 5). This document now correctly states the U-NII-5 band as being 5.925 to 6.425 GHz. This correction does not alter the substantive comments of the UWB Alliance. We apologize for any inconvenience this may have caused.

Respectfully Submitted,

Timothy Harrington
Executive Director
Ultra Wide Band Alliance

[1] Comments of the Ultra Wide Band Alliance, GN Docket No. 17-183 (filed October 11, 2018).

Ex Parte Comments of

The Ultra Wide Band Alliance

Before

The Federal Communications Commission

Notice of Inquiry on Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz.

GN Docket No. 17-183

October 16, 2018

About the UWB Alliance

The Ultra Wide Band Alliance ("UWB Alliance") is a global not-for-profit organization that works to collectively establish ultra-wideband (UWB) technology as an open-standards industry. A non-profit coalition made up of vendors that either design, manufacture, or sell products that use ultra-wideband technology, the UWB Alliance aims to promote and protect the current allocation of bandwidth as well as promote the continuing globalization of the technology. In addition, the Alliance is promoting and assuring interoperability through its work with Standards Development Organizations (SDOs) such as the IEEE and ETSI and then working with members to define upper layers and testing to assure compliance.

The UWB Ecosystem

The UWB ecosystem includes a wide range of applications varying from consumer items such as secure wireless vehicle key fobs to tool tracking for aircraft manufacturing. The current FCC regulations allow both UWB (15.517 – 15.519) and Wideband (15.250) devices to coexist well with other spectrum users, both licensed and license-exempt; as a result, the FCC has stimulated innovation in UWB applications, such as: Smartphone ecosystems; Consumer home automation, including automated lawnmowers; Sports tracking and analytics, including every NFL stadium; Secure automated vehicle lock/unlock; Aviation manufacture/tool tracking, including throughout 30 buildings across Boeing's four campuses; Wireless USB; and Automated automotive manufacturing. The IEEE projects the expanding UWB market will exceed 3.1 billion devices by 2025. But most importantly UWB has only begun to evolve technically, including expanding device ranges up to 1,000 feet and techniques that will offer equivalent Wi-Fi services, but at power levels that won't threaten other users of the band.

The Congressional mandate to add 100 MHz for highspeed wireless broadband is intended to foster innovative and efficient use of the spectrum. Common consumer standards such as Wi-Fi, Bluetooth, and ZigBee illustrate how innovative technologies can evolve to share a radio band to provide different services. Technologies evolve to meet the various need of potential users. Wi-Fi, an older technology, is optimized for moving large amounts of data, whereas UWB is optimized for location determination using short bursts. UWB is at the beginning of a growth spurt in both technological evolution and application development. UWB has the ability to expand to

provide broadband capabilities without requiring high power transmissions which can interfere with FS, FSS, and UWB users in the 6 GHz band. Additionally, the unique capabilities of impulse radio signals to be used for precise ranging enables an expanding number of new applications not possible with other technologies.

UWB is a "good neighbor" in that it shares the 6 GHz band with both Fixed Service (FS), and Fixed Satellite Services (FSS) with no known interference to these services. Additionally, since it operates at extremely low transmit power, -41.3 dBm/MHz, it allows other new technologies to coexist as they are developed. The use of this technology would not create any new interference to any current users.

Unfortunately, the current U-NII technology that is being promoted by the Wi-Fi industry is not as friendly to current services and applications. Specifying power levels of up to 4 Watts (+36 dBm) and utilizing the entire band from 5.925 to 7.125 GHz the Wi-Fi proponents will overwhelm UWB applications, and cause interference to FS and FSS license holders. The proposal is for a simple expansion of the band with old technology, as opposed to using innovation to better utilize bands and power levels that are already in available.

Analyzing the 6 GHz Wi-Fi proposals, they recommend allowing a maximum of 5.4 Gb/s in a bandwidth of 1.2 GHz. UWB in the 6.5 GHz and 7 GHz bands allows 2x27 Mbps = 54 Mbps using 802.15.4a (and upcoming 4z) standards in about the same bandwidth. Wi-Fi gets 100 times the bitrate but for 676,000 times the power (58.3 dB higher at +17 dBm/MHz vs -41.3 dBm/MHz). The 802.15.4a UWB standard is optimized for precision ranging, not high data rates. UWB is at the beginning of its life by comparison, and there are opportunities to increase the data rate through innovative improvements that could equal and exceed the Wi-Fi data rate but without the requirement for that much power, with characteristics that can coexist more readily with the existing and emerging technologies already using the band.

The NPRM, in its current draft form, divides the band into four bands that alternate between high power and lower power:

Band (GHz)	Primary Allocations	Reference used in this NPRM	Devices
5.925-6.425	Fixed Service FSS	U-NII-5	Standard-Power Access Point
6.425-6.525	Mobile Service FSS	U-NII-6	Low-Power Access Point
6.525-6.875	Fixed Service FSS	U-NII-7	Standard-Power Access Point
6.875-7.125	Fixed Service Mobile Service FSS[64]	U-NII-8	Low-Power Access Point

This division attempts to maximize the availability of the highest power levels. Unfortunately, a consequence of this division is that it will not allow UWB devices to operate even if the overall power levels are reduced to a level that is friendlier to current licensed and unlicensed devices.

Given that the justification for the NPRM, the power levels specified should not be required:

- Rural environments do not require 6 GHz, as there is adequate bandwidth at 2.4 and 5.8 GHz. If range and area coverage is the issue for rural environments, they are better served at these lower frequencies which do not fade as quickly.
- Urban environments do not require high power. In fact, high power is detrimental to frequency reuse. As witnessed by the licensed mobile services industry, cell sizes and power output continue to shrink because the demand in urban areas is for more capacity, not more range.

Additional considerations: There is potential for achieving broadband data rates with new technologies compliant with the current FCC regulations for UWB and broadband devices in the 6 GHz band. Following adoption of the UWB rules, specifications were developed by the WiMedia Alliance that specified a PHY layer that would be capable of 1.024 Gbps meeting FCC certification requirements. The existence proof of past certifications strongly suggests the potential for new innovations which can meet the data rate and device density requirements of RLAN without fundamentally changing the existing rules.

UWB Alliance Recommendations

Need for additional studies

The UWB Alliance and others such as AT&T have performed an initial evaluation of coexistence between current users of the 6 GHz band. The results are not good. To date, there has been no thorough analysis performed to evaluate the threat to the UWB community. The study RKF study referenced by the RLAN proponents examines only a subset of licensed Fixed Service users; the RKF Engineering Solutions study is incomplete and the conclusions stated by WFA are flawed. The RKF study was commissioned by the RLAN proponents, and hence the results are predictable. The study, by RKF's own admission, is incomplete and lacking thorough evaluations of other users in the frequency band. The results are analogous to all the studies that showed smoking was not detrimental to respiratory health that were commissioned by the cigarette industry in the 60's.

Preliminary empirical studies performed by UWB Alliance members indicate conventional RLAN signals at the power levels currently typical of RLAN APs and STAs can cause significant interference[2]. This study used production standard based UWB transceivers and simulates the RLAN signals; measurement and analysis indicate that RLAN signals at 100mw can disrupt the system compliant with current FCC license exempt regulations within a radio sphere of influence (SoI) of around 300m. In contrast, when operating at the power currently allowed in the 6 GHz band, separation distances of less than 2m provide reasonable coexistence.

Further studies are currently underway by UWB Alliance members, using both measured interference and simulation techniques. Based on work completed so far, we have identified some mitigations that enable new uses, including RLAN, but with less risk to both licensed and licensed exempt users operating in compliance with existing regulations.

As such, we strongly urge the Commission's forbearance in promulgating any rules or regulations until such studies can be completed and its data properly assessed.

[2] In-band Interference Effects on 802.15 UWB, Decawave presentation to IEEE 802.19, March 3, 2018.

Power Recommendations

Since the mandate from Congress is to add 100 MHz bandwidth, the 1.2 GHz proposal far exceeds the mandate. If the band were to be divided to allow U-NII 8 to be at the currently specified low power level, that would add 250 MHz at a part of the spectrum that could coexist with all incumbent users. Additionally, if U-NII 5 were changed to be 5.925 to 6.245 GHz, at that same lower power level, that would yield an additional 320 MHz, for a total addition of 570 MHz, more that 5X the mandate from Congress. If the power levels of the new U-NII 6 and 7 were reduced to -40 dBm/MHz, then the entire 1.2 GHz could be available at level that does not interfere with incumbent users.

Band (GHz)	Primary Allocations	Reference used in this NPRM	Devices
5.925-6.425	Fixed Service FSS	U-NII-5	Standard low power
6.425-6.525	Mobile Service FSS	U-NII-6	-40 dBm
6.525-6.875	Fixed Service FSS	U-NII-7	-40 dBm
6.875-7.125	Fixed Service Mobile Service FSS[64]	U-NII-8	Standard low power

Specifying power limits compatible with existing rules in that part of the band most frequently used today ensures innovative vendors and adopters of current technologies are not penalized under the new rules, while still providing much more than the 100MHz of additional spectrum mandated by Congress. New developments of both RLAN and UWB will be encouraged to take advantage of new rules, while having a clear path to remain compatible and interoperable with existing deployments.

Operational Recommendations

Consideration of the following operational limits and conditions can mitigate interference potential and still meet the mandate for additional broadband spectrum:

- RLANs: Restrict RLAN to indoor operation only in the 6 GHz bands U-NII-6 and U-NII-7.
- Mobile APs: Do not allow mobile APs in the 6 GHz bands U-NII-6 and U-NII-7.
- Geographical Exclusions: In evaluating proposals for geographically-based solutions to protecting incumbent users, we note that for the largest growing sector of our market base – secure access and smart phones – the geographical mapping approach does not mitigate interference risks due to the rate of mobility of smart phone and automotive users. Evaluation of geographical exclusions should also consider the mobility use cases of UWB applications.

Suggested Specific Questions the NPRM should pose to the industry/public:

The UWB Alliance recommends the following questions be included in the NPRM to enable the Commission to better understand the needs of industry and spectrum users.

1. How will the proposed rule changes impact licensed exempt operations currently compliant with Subpart F (§15.501 through §15.525) and Wideband (§15.250)?
2. Are there alternatives to the specified band designations given in this NPRM would be beneficial to achieve more effective use of the spectrum resources?
3. What are the key metrics used for measuring efficiency and effectiveness in spectrum utilization?
4. Are there additional technical considerations which may allow conditional power and bandwidth limitations which can provide coexistence of the wide array of spectrum users while enabling new use of the spectrum?

The UWB Alliance thanks you for this opportunity to comment on the draft NPRM and stands ready to answer any questions the Commission may have.